

Modifications of antioxidant enzymes as a tool to improve yield in tomato under water deficit

Noé Gest, Cecile Garchery, Mathilde M. Causse, Hélène Gautier, Pierre

Baldet, Rebecca Stevens

▶ To cite this version:

Noé Gest, Cecile Garchery, Mathilde M. Causse, Hélène Gautier, Pierre Baldet, et al.. Modifications of antioxidant enzymes as a tool to improve yield in tomato under water deficit. 2nd International Symposium on Biotechnology of Fruit Species, Mar 2012, Nelson, New Zealand. 228 p. hal-02745000

HAL Id: hal-02745000 https://hal.inrae.fr/hal-02745000

Submitted on 3 Jun2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers. L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Modifications of Antioxidant Enzymes as a Tool to Improve Yield in Tomato under Water Deficit

Noé Gest¹, Cécile Garchery¹, Mathilde Causse¹, Hélène Gautier², Pierre Baldet³, <u>Rebecca Stevens¹</u>

¹ INRA, UR1052, Génétique et amélioration des fruits et légumes, Domaine St Maurice BP94, 84143 Montfavet, France

² INRA, UR1115, Plantes et systèmes de culture horticoles, Domaine St Paul, Site Agroparc, 84914 Avignon, France

³ INRA, UMR 619, Biologie du Fruit, BP 81, 33883 Villenave d'Ornon, France

Water supply is the greatest single limitation on crop yields and improving agricultural productivity while reducing water use is of increasing importance for world food production. Maintenance of productivity under unfavourable environmental conditions is a stress tolerance trait. The response to stress involves the plant's antioxidant defences and maintenance of a redox equilibrium. Antioxidants such as ascorbate can therefore protect the plant from different types of stresses, including drought, and enzymes controlling the redox state of the ascorbate pool are likely to be suitable candidates for stress tolerance traits. We will show with our work in tomato that ascorbate oxidase and monodehydroascorbate reductase, two enzymes involved in the maintenance of the ascorbate redox state, affect yield in tomato in response to the environment. Tomato plants expressing an RNAi ascorbate oxidase construct show improved yield under conditions of water deficit, and other conditions where the production of assimilates is limited, whereas plants expressing an RNAi monodehydroascorbate reductase construct have decreased yield and fruit size under normal conditions, the decrease in yield being more severe when plants are grown under water deficit. The effects seen on plant and fruit development in the transgenic plants are due to modifications to carbon metabolism and carbon allocation between source leaves and fruit. The effects seen are specific to each enzyme and under different environmental control. Mechanistic details concerning alterations to carbon metabolism, notably sugar accumulation in both leaves and fruits, will be given to explain how the activity of these two enzymes could be influencing yield.

http://www.biotechfruit2012.com/page/registration/abstract-submission/? id=232&code=6dMdfQj7HWVRPq5d&preview=TRUE